# Montana Fish, Wildlife & Parks
# Fisheries Division

*Draft*
## Environmental Assessment

# Elkhorn Mountain Westslope Cutthroat Trout Recovery Program: Expansion of Hall Creek and Prickly Pear Creek Westslope Cutthroat Trout Populations

## PART 1. PROPOSED ACTION DESCRIPTION

**A. Type of Proposed Action:** The proposed project is designed to increase the distribution of pure westslope cutthroat trout (WCT) by introduction of fertilized WCT eggs and/or live fish into fishless stream areas above natural barriers. The project is part of the overall Elkhorns Cutthroat Trout Recovery Program (FWP 1999a), which is intended to expand the current distribution and reduce the extinction risk of the six remaining pure WCT populations in the Elkhorn Mountain Range (near Helena, Montana).

**B. Agency Authority for the Proposed Action:** Montana Fish, Wildlife & Parks (FWP) "…is hereby authorized to perform such acts as may be necessary to the establishment and conduct of fish restoration and management projects…" under MCA statute 87-1-702.

**C. Location of Project:** The proposed action includes four streams in the Elkhorn Mountains:
- WCT donor streams: *Hall Creek (T7N, R1W) and Prickly Pear Creek (T7N, R3W).*
- WCT introduction streams: *Eureka Creek (T7N, R1W), Little Tizer Creek (T7N, R2W), and upper Prickly Pear Creek (T7N, R3W).*

**D. Estimated commencement date:** June 2001
*Estimated completion date:* 2005 – 2010

**F. Project size (acres affected):**
1. Developed/ residential – 0 acres
2. Industrial – 0 acres
3. Open space – 0 acres
4. Wetland/ riparian – WCT would be introduced into about 5 miles of stream
5. Floodplain – 0 acres
6. Irrigated cropland – 0 acres
7. Dry cropland – 0 acres
8. Forestry – 0 acres
9. Rangeland – 0 acres
10. Other – 0 acres



Broadwater
Jefferson
Lewis and Clark

## G. Need and Purpose for Proposed Action:

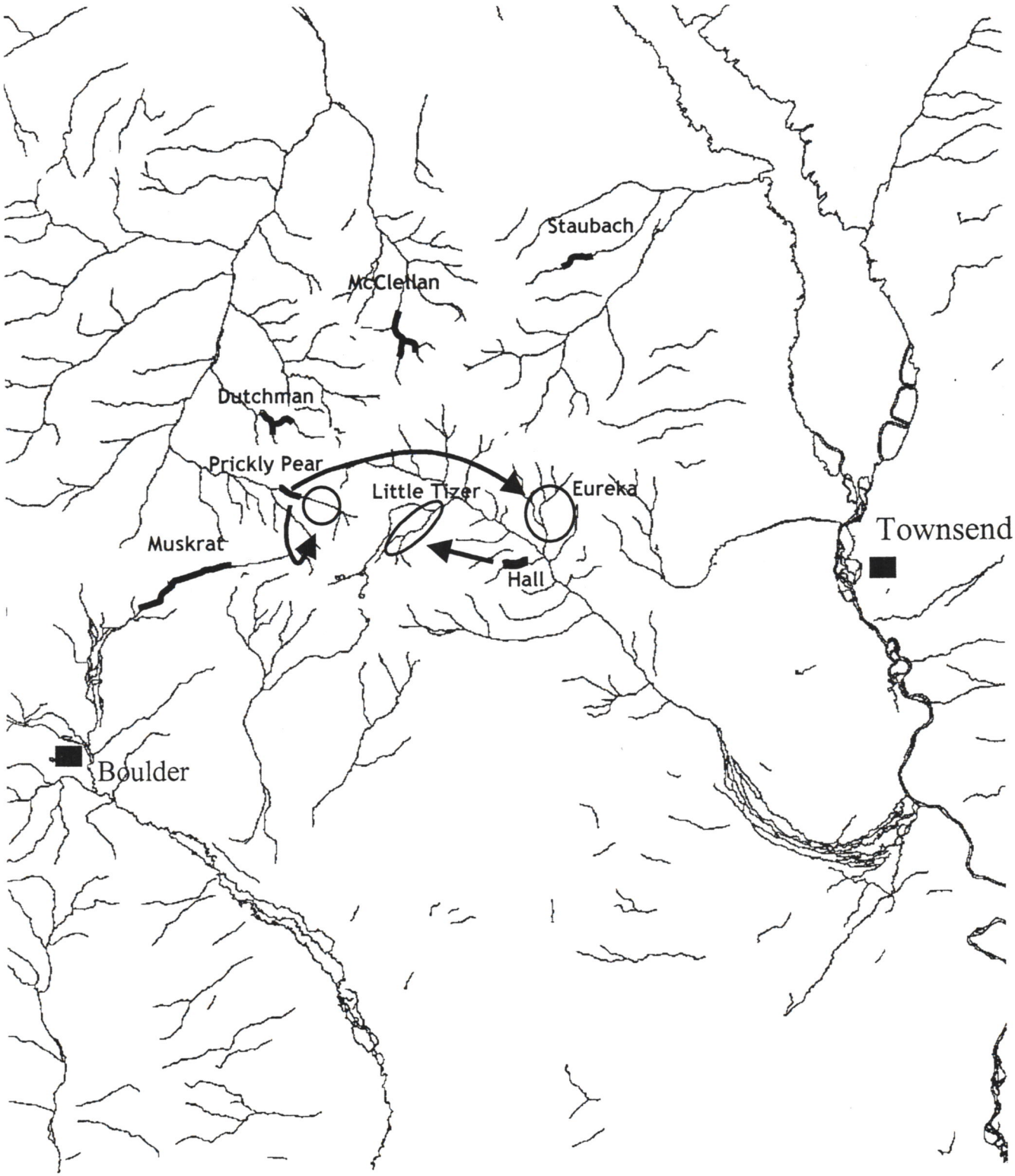
Westslope cutthroat trout have declined in abundance and distribution throughout Montana, and in the Missouri River Basin they are thought to occupy less than 5% of their historic range (Shepard et al. 1997). Major factors contributing to this decline include competition with nonnative trout (brook, brown, rainbow, and Yellowstone cutthroat trout) that were first introduced to Montana in the 1890's, hybridization with rainbow and Yellowstone cutthroat trout, habitat changes, and over-exploitation. Most remaining WCT populations are isolated in headwater mountain streams and a majority have a very high risk of extinction – indicating their probability of persistence for more than 100 years is low. Several WCT populations are known to have gone extinct in the last 20 years in the Missouri River Basin, including in the South Fork of Warm Springs Creek in the Elkhorn Mountains where the population likely disappeared due to competition with brook trout.

Six pure WCT populations remain in the Elkhorn Mountains (Figure 1). In total, these populations only occupy about 10 miles of stream, whereas nonnative trout (e.g., brook trout) occupy about 112 miles of stream. In addition to competition with nonnative trout, threats to remaining Elkhorn populations include small populations sizes (about 60 to 500 WCT per population) and restricted distribution (0.5 to 3 miles) within each stream. These relatively short distributions indicate there may be inadequate refuge areas that would protect these populations during severe disturbances like floods, fires, and debris flow. Overall, current WCT distribution and abundance (2,000 – 3,000 total WCT) in the Elkhorn Mountains is much reduced than what would be expected without nonnative competition and habitat changes (e.g., historic placer mining). Because each WCT population in the Elkhorn Mountains has a high risk of extinction, the likelihood of long-term persistence of WCT in the mountain range is considered low unless restoration activities secure and increase the number and distribution of remaining populations. To date, restoration efforts in the Elkhorn Mountains have involved reducing nonnative competition with WCT in Muskrat and Staubach creeks by capturing brook trout with electrofishing, and placing them below barriers constructed to prevent their upstream migration.

In 1999 the State of Montana, along with several federal agencies and non-government organizations, signed a Memorandum of Understanding (MOU) and Conservation Agreement for WCT (FWP 1999b) to provide direction in conserving WCT populations throughout their historic range in Montana. In addition, FWP, the U.S. Forest Service, and the Bureau of Land Management signed an MOU (FWP 1999c) to manage existing populations within the Elkhorn Mountains, and are cooperatively implementing the Elkhorn Mountains Cutthroat Trout Restoration Program (FWP 1999a). The goal of both agreements is to ensure the continued persistence of WCT in the Missouri River Basin and the Elkhorn Mountains by securing and expanding remaining pure WCT populations. Expansion of populations would occur by introduction of WCT into streams where nonnative trout were first removed, or into streams that were previously fishless.

The proposed action described in this Environmental Assessment (EA) seeks to expand two pure WCT populations in the Elkhorn Mountains by placing eggs and/or live fish into currently fishless stream reaches. Success of this proposed action would increase the current distribution of WCT in the Elkhorn Mountains by about 5 stream miles. In theory, by "replicating" each

Figure 1. Approximate location of WCT populations in the Elkhorn Mountains (heavy black lines), and potential introduction areas (circles). Arrows indicate proposed path of WCT transfers between streams.



population into new areas, the extinction risk and potential loss of genetic diversity for each population would be reduced. This restoration concept is based on the principle that larger population sizes maintained by more habitat will preserve genetic diversity, and that donor (old) and new populations are unlikely to go extinct at the same time.

**H. Narrative Summary of Proposed Action:**

The proposed action is to expand two existing WCT populations into three currently fishless stream reaches. At present, natural migration barriers (i.e., waterfalls) prevent fish from occupying these stream reaches, however, the habitat is believed suitable for fish. In addition to expanding the overall WCT distribution in the Elkhorn Mountain Range, this project would also create genetic reserves for "at risk" populations within the area. **Unlike the use of hatchery fish, this conservation approach will use donor WCT populations that have adapted to habitat conditions in the Elkhorn Mountains; by this means the introduced populations will have a better chance for long-term persistence, and will perpetuate locally adapted genetic characteristics**. Specifically, the proposal is to remove eggs from a small number of fish in Hall and Prickly Pear creeks (donor streams) and transfer them to barren stream reaches in Eureka, Little Tizer, and upper Prickly Pear creeks (recipient streams) (Figure 1). Concurrently, a small number of WCT (50 – 100) would also be moved above a natural barrier in Prickly Pear Creek to supplement the egg transfer to this currently fishless reach. Biological and physical details of each stream are given in Appendix A.

The duration of the project, 5 to 10 years, is intended to minimize impacts to the donor populations by reducing the number of eggs or fish removed from a population each year. At a minimum, gametes (eggs and sperm) from 25 males and 25 females from each donor population will be moved during the project to provide adequate genetic diversity for the new populations (Leary et al. 1998). Live fish moved above the natural barrier in Prickly Pear Creek will be in addition to the egg transfers, and will serve to further increase the genetic diversity of the new population. Abundance of each donor population will be assessed every 2 years for the duration of the project to determine whether previous removals are impacting the population and to determine the appropriateness of future removals.

This project will primarily rely on introduction of fertilized eggs because disease concerns prevent transfer of live wild fish between streams in most situations; many fish diseases, like whirling disease, are not transferred through eggs (see page 10 and Appendix A for further discussion of disease concerns). The removal of eggs from the donor population is also less likely to have negative impacts (i.e., reduction in abundance) on the population than the removal of a large number of fish. The duration of the project (5 to 10 years) will depend on success of egg rearing, fry survival, and the year-to-year abundance of the donor populations. Egg introductions will include Hall Creek eggs to Little Tizer Creek, and Prickly Pear Creek eggs to upper Prickly Pear (above natural barrier) and Eureka creeks (Figure 1). These transfers are partially based on the similarity of habitat between donor and recipient stream, and the distance between streams that will reduce the likelihood of a localized disturbance eliminating donor and new populations at the same time. Donor populations are pure WCT, and while small, are considered abundant enough to withstand limited egg removals (see Appendix A).

Timeframe and specific strategies of the egg introduction:

1. ***Collect eggs from Hall and Prickly Pear creek WCT populations.*** Gametes will be collected during June 2001, and successive years, from about seven female and seven male WCT in each donor stream. Annual collections would continue until gametes from at least 25 females and 25 males are successfully introduced into each recipient stream. Fish will be captured by electrofishing at known spawning locations. In an effort to duplicate the genetic diversity of the donor populations into the receiving streams, we will collect gametes from random adult fish without regard to their appearance (e.g., spotting pattern or coloration). Efforts will also be made in succeeding years to collect gametes from fish that spawn both early and late during the spawning period, which may be an important genetic characteristic of populations living in mountain streams with variable spring habitat conditions. Eggs from each donor female will be separated into two lots, and then each lot will be fertilized with a different male. This approach will reduce the chance of losing all eggs from one female if a male is not fertile. Prior to being returned live to the stream, donor fish will be marked with an adipose fin-clip so they are not used as donors in following years. Washoe State Fish Hatchery personnel will provide technical expertise for the egg collections.

2. ***Egg incubation – Washoe State Fish Hatchery.*** Fertilized eggs will be immediately moved to Washoe State Fish Hatchery for about 5 weeks of incubation. The use of the hatchery is an attempt to reduce egg mortality that may occur with on-site stream incubation. At the hatchery, eggs from each mating will be kept separate until the viability of the eggs is known. This method will help us determine the relative contribution of each female and male to the new population, and will allow us to determine when gametes from a minimum of 50 adult fish have been introduced to the new streams. To minimize possible disease transfer, eggs from each stream will be isolated, and prior to bringing eggs back into the wild they will be disinfected with formalin and iodine (external disinfectants). Eggs will be incubated in the hatchery until about 1 week pre-hatch.

3. ***On-site egg incubation/fry rearing.*** One week pre-hatch, eggs will be moved to streamside incubators in donor (to replace a portion of removed eggs) and receiving streams. Streamside incubators consist of a 5-gallon plastic bucket, plastic pipes to provide water flow to the bucket, and artificial substrate to provide shelter for eggs and fry. Incubators will be placed on each stream at least 1 week prior to the addition of the eggs to ensure proper operation. To reduce the chance of losing large numbers of eggs through unforeseen events (e.g., loss of water), up to three streamside incubators will be operated on each of the receiving streams (Eureka, Little Tizer, and upper Prickly Pear creeks). Incubators will be checked 1 or 2 times each week to monitor water flow, remove dead eggs, and to monitor egg and fry development. Fry will disperse voluntarily from the incubators after about 4 weeks of development.

It is anticipated that each collected female WCT will provide approximately 250 – 300 eggs. About 90% of the eggs will be introduced into receiving streams, and the remaining will be returned to the donor streams to partially mitigate for lost reproduction due to the egg removal.

The returned eggs represent about what natural reproduction would have supplied to the population, under the assumption that natural egg mortality is much higher than will be observed during the project. Assuming 20% egg mortality in the hatchery and streamside incubators (based on other studies), about 1,200 fry would be introduced into Little Tizer Creek, 1,000 fry into Eureka Creek, and 200 fry into the upper reach of Prickly Pear Creek during the first introduction year.

An additional phase of this project would be to move a small number (50 – 100) of WCT from the lower reach of Prickly Pear Creek to an upper reach that is isolated by a natural barrier and is currently barren of fish. This introduction would coincide with the introduction of Prickly Pear Creek WCT eggs and would serve to increase the genetic diversity and growth of the new population. Similar to egg introductions, the number of fish moved would correspond to the year-to-year abundance of the donor population, and is likely to be less than 25 fish per year. Juvenile fish would usually be moved in these transfers because in most populations younger fish generally have higher mortality rates due to overcrowding; as such, the removal of juvenile fish is less likely to have negative impacts on the donor population than removal of adult fish. Fish would be collected at various locations along the creek, and may be captured using various methods including electrofishing, seining, and trapping. A similar live WCT transfer above a natural barrier in Muskrat Creek (Figure 1) has proven successful in that introduced WCT successfully reproduced the first year after introduction, and because the population is now secure in a reach isolated from brook trout.

Project Preparation and Review Process

Information collected prior to preparation of this EA included WCT abundance, genetic purity, and fish disease presence in donor streams; presence of fish, amphibians, and invertebrates in receiving streams; and quality and quantity of habitat in receiving streams (Appendix A). Collected information has fulfilled requirements for egg and fish transfers within Montana waters (FWP Policy), and the Montana Fish, Wildlife & Parks Fish Health Committee has approved the transfer protocol (Jim Peterson, personal communication, 2000). Lastly, the methodologies proposed in this EA were reviewed and approved by the Westslope Cutthroat Trout Technical Committee, a group composed of State and federal fisheries biologists that have developed guidelines for WCT restoration activities.

## I. Benefit of Project:

This project implements part of the Elkhorn Mountain Westslope Cutthroat Trout Recovery Plan by expanding the distribution of two pure WCT populations that currently have a high risk of extinction. With successful introduction, the overall range of WCT in the Elkhorn Mountains will increase by about 5 stream miles, which is about a 50% increase from current distribution. Replication of these populations into new waters will reduce the likelihood of losing unique genetic adaptations through local population extinction. Consequently, this project will help achieve the goal and objectives listed in the conservation agreements for restoration of WCT both statewide and in the Elkhorn Mountains. State restoration projects like this were one reason

cited by the U.S. Fish and Wildlife Service to conclude that listing WCT under the Endangered Species Act is not currently warranted (Federal Register, April 14, 2000).

### J. Other Local, State, or Federal agencies with Overlapping Jurisdiction:

The U.S. Forest Service manages land adjacent to donor and recipient streams, however, the State maintains authority on regulating fisheries within the streams. Along with the State though, the Forest Service is a cosigner of a Memorandum of Understanding (FWP 1999b) that outlines the agreement between agencies regarding recovery and management of WCT in the Elkhorn Mountains. The MOU states, "The purpose of the Elkhorn Mountains Cutthroat Trout Restoration Program is to secure existing populations of Missouri River westslope cutthroat trout within the streams flowing within and from the Elkhorn Mountains, and to expand cutthroat distribution in suitable barren habitats".

### K. Agencies Consulted During the Preparation of the EA:

- Montana Fish, Wildlife & Parks – Anaconda, Bozeman, Great Falls, Helena
- U.S.D.A Forest Service – Helena National Forest
- University of Montana, Wild Trout and Salmon Genetics Laboratory – Missoula

## PART II. ENVIRONMENTAL REWIEW

A. PHYSICAL ENVIRONMENT

| 1. LAND RESOURCES<br>Will the proposed action result in: | IMPACT Unknown | None | Minor | Potentially Significant | Can Impact Be Mitigated | Comment Index |
|---|---|---|---|---|---|---|
| a. Soil instability or changes in geologic substructure? | | X | | | | |
| b. Disruption, displacement, erosion, compaction, moisture loss, or over-covering of soil that would reduce productivity or fertility? | | X | | | | |
| c. Destruction, covering or modification of any unique geologic or physical features? | | X | | | | |
| d. Changes in siltation, deposition or erosion patterns that may modify the channel of a river or stream or the bed or shore of a lake? | | X | | | | |
| e. Exposure of people or property to earthquakes, landslides, ground failure, or other natural hazard? | | X | | | | |

| 2. WATER<br>Will the proposed action result in: | IMPACT Unknown | None | Minor | Potentially Significant | Can Impact Be Mitigated | Comment Index |
|---|---|---|---|---|---|---|
| a. Discharge into surface water or any alteration of surface water quality including but not limited to temperature, dissolved oxygen or turbidity? | | X | | | | |
| b. Changes in drainage patterns or the rate and amount of surface runoff? | | X | | | | |
| c. Alteration of the course or magnitude of floodwater or other flows? | | X | | | | |
| d. Changes in the amount of surface water in any water body or creation of a new water body? | | X | | | | |
| e. Exposure of people or property to water related hazards such as flooding? | | X | | | | |
| f. Changes in the quality of groundwater? | | X | | | | |
| g. Changes in the quantity of groundwater? | | X | | | | |
| h. Increase in risk of contamination of surface or groundwater? | | X | | | | |
| i. Effects on any existing water right or reservation? | | X | | | | |
| j. Effects on other water users as a result of any alteration in surface or groundwater quality? | | X | | | | |
| k. Effects on other users as a result of any alteration in surface or groundwater quantity? | | X | | | | |
| l. Will the project affect a designated floodplain? | | X | | | | |
| m. Will the project result in any discharge that will affect federal or state water quality regulations? (Also see 2a) | | X | | | | |

| 3. AIR<br>Will the proposed action result in: | IMPACT Unknown | None | Minor | Potentially Significant | Can Impact Be Mitigated | Comment Index |
|---|---|---|---|---|---|---|
| a. Emission of air pollutants or deterioration of ambient air quality? (also see 13 (c)) | | X | | | | |
| b. Creation of objectionable odors? | | X | | | | |
| c. Alteration of air movement, | | X | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| moisture, or temperature patterns or any change in climate, either locally or regionally? | | | | | | |
| d. Adverse effects on vegetation, including crops, due to increased emissions of pollutants? | | X | | | | |
| e. Will the project result in any discharge that will conflict with federal or state air quality regs? | | X | | | | |

| **4. VEGETATION**<br>**Will the proposed action result in:** | **IMPACT Unknown** | **None** | **Minor** | **Potentially Significant** | **Can Impact Be Mitigated** | **Comment Index** |
|---|---|---|---|---|---|---|
| a. Changes in the diversity, productivity or abundance of plant species (including trees, shrubs, grass, crops, and aquatic plants)? | | X | | | | |
| b. Alteration of a plant community? | | X | | | | |
| c. Adverse effects on any unique, rare, threatened, or endangered species? | | X | | | | |
| d. Reduction in acreage or productivity of any agricultural land? | | X | | | | |
| e. Establishment or spread of noxious weeds? | | X | | | | |
| f. Will the project affect wetlands, or prime and unique farmland? | | X | | | | |

| **5. FISH/WILDLIFE**<br>**Will the proposed action result in:** | **IMPACT Unknown** | **None** | **Minor** | **Potentially Significant** | **Can Impact Be Mitigated** | **Comment Index** |
|---|---|---|---|---|---|---|
| a. Deterioration of critical fish or wildlife habitat? | | X | | | | |
| b. Changes in the diversity or abundance of game animals or bird species? | | | X | | No | 5b |
| c. Changes in the diversity or abundance of nongame species? | | | X | | No | 5c |
| d. Introduction of new species into an area? | | | X | | No | 5d, also see 5c |
| e. Creation of a barrier to the migration or movement of animals? | | X | | | | |
| f. Adverse effects on any unique, rare, threatened, or endangered species? | | X | | | | 5c |
| g. Increase in conditions that stress wildlife populations or limit abundance (including harassment, legal or illegal harvest or other human activity)? | | X | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| h. Will the project be performed in any area in which T&E species are present, and will the project affect any T&E species or their habitat? (Also see 5f) | | X | | | | |
| i. Will the project introduce or export any species not presently or historically occurring in the receiving location? (Also see 5d) | | | X | | No | 5b & 5d |

**Comment 5b:** The proposed project would increase the abundance and range of pure WCT in the Elkhorn Mountains by introduction of eggs and/ or live fish into stream reaches that are currently barren of fish. Increase in WCT distribution would be about 2 miles in Eureka Creek, 2 miles in Little Tizer Creek, and 1 mile in upper Prickly Pear Creek. This is a minor impact because no displacement of other game fish is expected, and the distribution of a game fish (WCT) in the Elkhorns would increase. Occasionally, WCT will disperse downstream from the areas they were introduced; however, dispersing WCT are unlikely to establish reproducing populations due to nonnative trout competition. In the long-term, an overall increase in angling opportunities is expected with this project. Westslope cutthroat trout are currently protected under catch and release regulations in streams of the Missouri River drainage; however, a goal of FWP is to restore WCT populations to harvestable levels in the future.

A potential impact of between stream egg transfers and the use of a hatchery for egg rearing is the introduction of new fish diseases. To address this concern disease tests were conducted on fish from both donor populations (see Appendix A). Fish samples were tested for the presence of bacterial kidney disease (BKD), red mouth disease, whirling disease, furunculosis, infectious pancreatic necrosis (IPN), and viral hemorrhagic septicemia (VHS) viruses. Results indicated no disease present that is not common to wild trout populations. In addition, the potential of disease being transferred from hatchery to the wild will be reduced by isolating eggs in the hatchery, and by treating eggs with formalin and iodine (external disinfectants) during incubation and prior to placement in on-site, streamside incubators.

**Comment 5c:** The proposed action will introduce WCT into stream reaches that are currently barren of fish. A potential impact of any fish introduction into a barren stream is on resident aquatic invertebrates and amphibians. To address aquatic invertebrate concerns, Dr. Dan Gustafson (Montana State University) collected invertebrates above and below the natural barriers in each of the receiving streams to determine the presence of any threatened or endangered species. His collections found: 1) no threatened or endangered invertebrate species, 2) species found are common and widespread in the Rocky Mountains, and 3) all species collected occur at other sites where fish are present. Based on the invertebrate communities, his conclusion was that there is no reason why fish transfers should not take place. Appendix B lists aquatic invertebrate species collected by Dr. Gustafson during these surveys.

The introduction of WCT into barren streams in the Elkhorn Mountains in unlikely to impact native amphibians. Species sensitive to fish introductions generally breed in lakes or ponds, and would not be affected by the proposed stream introductions. The only stream breeding species common to the area, the Columbia spotted frog, has co-evolved and coexists elsewhere with

native WCT. Electrofishing surveys were conducted, however, to determine if unexpected species like the Pacific giant salamander and tailed frog were present in the mountain range. None were found in surveys of the potential receiving streams (Appendix A). Furthermore, slow water areas (e.g., beaver ponds and old side-channels) that are preferred by amphibians, are also uncommon in these streams.

**Comment 5d:** This project would introduce WCT into stream reaches that are currently barren of fish. While WCT are native to the Elkhorn Mountain Range, it is unknown if they historically occupied any of the currently fishless areas. Even with successful introductions, it is likely the upper ends of all streams will remain fishless due to their small size. Also see comment 5c.

B. HUMAN ENVIRONMENT

| **6. NOISE/ELECTRICAL EFFECTS**<br>**Will the proposed action result in:** | **IMPACT Unknown** | **None** | **Minor** | **Potentially Significant** | **Can Impact Be Mitigated** | **Comment Index** |
|---|---|---|---|---|---|---|
| a. Increases in existing noise levels? | | X | | | | |
| b. Exposure of people to serve or nuisance noise levels? | | X | | | | |
| c. Creation of electrostatic or electromagnetic effects that could be detrimental to human health or property? | | X | | | | |
| d. Interference with radio or television reception and operation? | | X | | | | |

| **7. LAND USE**<br>**Will the proposed action result in:** | **IMPACT Unknown** | **None** | **Minor** | **Potentially Significant** | **Can Impact Be Mitigated** | **Comment Index** |
|---|---|---|---|---|---|---|
| a. Alteration of or interference with the productivity or profitability of the existing land use of an area? | | X | | | | 7a |
| b. Conflicted with a designated natural area or area of unusual scientific or educational importance? | | X | | | | |
| c. Conflict with any existing land use whose presence would constrain or potentially prohibit the proposed action? | | X | | | | |
| d. Adverse effects on or relocation of residences? | | X | | | | |

**Comment 7a.** Introduction of WCT is not expected to have any impacts on current land activities in areas adjacent to the streams in the Helena National Forest. The Elkhorn Mountains are currently designated as the "Elkhorns Wildlife Management Unit", which establishes land management guidelines that maintain or enhance wildlife habitats. Accordingly, riparian guidelines are set for management of streamside areas regardless of the presence of fish.

Therefore, under the current management guidelines, habitat conditions are suitable for WCT in the receiving streams, and no additional restrictions on land management activities are required at this time to protect stream reaches with WCT introductions.

| 8. RISK/HEALTH HAZARDS<br>Will the proposed action result in: | IMPACT Unknown | None | Minor | Potentially Significant | Can Impact Be Mitigated | Comment Index |
|---|---|---|---|---|---|---|
| a. Risk of an explosion or release of hazardous substances (including, but not limited to oil, pesticides, chemicals, or radiation) in the event of an accident or other forms of disruption? | | X | | | | |
| b. Affect an existing emergency response or emergency evacuation plan or create a need for a new plan? | | X | | | | |
| c. Creation of any human health hazard or potential hazard? | | X | | | | |
| d. Will any chemical toxicants be used? | | X | | | | |

| 9. COMMUNITY IMPACT<br>Will the proposed action result in: | IMPACT Unknown | None | Minor | Potentially Significant | Can Impact Be Mitigated | Comment Index |
|---|---|---|---|---|---|---|
| a. Alteration of the location, distribution, density, or growth rate of the human population of an area? | | X | | | | |
| b. Alteration of the social structure of a community? | | X | | | | |
| c. Alteration of the level or distribution of employment or community or personal income? | | X | | | | |
| d. Changes in industrial or commercial activity? | | X | | | | |
| e. Increased traffic hazards or effects on existing transportation facilities or patterns of movement of people and goods? | | X | | | | |

| 10. PUBLIC SERVICES/TAXES/UTILITIES<br>Will the proposed action result in: | IMPACT Unknown | None | Minor | Potentially Significant | Can Impact Be Mitigated | Comment Index |
|---|---|---|---|---|---|---|
| a. Will the proposed action have an effect upon or result in a need for new or altered governmental services in | | X | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| any of the following areas: fire or police protection, schools, parks/recreational facilities, roads or other public maintenance, water supply, sewer or septic systems, solid waste disposal, health, or other governmental services? If any, specify: _____ | | | | | | |
| b. Will the proposed action have an effect upon the local or state tax base and revenues? | | X | | | | |
| c. Will the proposed action result in a need for new facilities or substantial alterations of any of the following utilities: electric power, natural gas, other fuel supply or distribution systems, or communications? | | X | | | | |
| d. Will the proposed action result in increased used of any energy source? | | X | | | | |
| e. Define projected revenue sources | | | | | | 10e |
| f. Define projected maintenance costs | | | | | | 10e |

**Comment 10e:** The proposed project is part of the ongoing Elkhorn Mountains Westslope Cutthroat Trout Restoration Program (FWP 1999a) and would not require additional funding for implementation or maintenance. The Elkhorns Program is jointly funded by FWP, the U.S. Forest Service (through Bring Back the Natives program), the Bureau of Land Management, and Montana Trout Unlimited.

| **11. AESTHETICS/RECREATION**<br>**Will the proposed action result in:** | **IMPACT Unknown** | **None** | **Minor** | **Potentially Significant** | **Can Impact Be Mitigated** | **Comment Index** |
|---|---|---|---|---|---|---|
| a. Alteration of any scenic vista or creation of an aesthetically offensive site or effect that is open to public view? | | X | | | | |
| b. Alteration of the aesthetic character of a community or neighborhood? | | X | | | | |
| c. Alteration of the quality or quantity of recreational/tourism opportunities and settings? (Attach Tourism Report) | | X | | | | |
| d. Will any designated or proposed wild or scenic rivers, trails or wilderness areas be impacted? (Also see 11a, 11c) | | X | | | | |

| 12. CULTURAL/HISTORICAL RESOURCES<br>Will the proposed action result in: | IMPACT Unknown | None | Minor | Potentially Significant | Can Impact Be Mitigated | Comment Index |
|---|---|---|---|---|---|---|
| a. Destruction or alteration of any site, structure or object of prehistoric historic, or paleontological importance? | | X | | | | |
| b. Physical change that would affect unique cultural values? | | X | | | | |
| c. Effects on existing religious or sacred uses of a site or area? | | X | | | | |
| d. Will the project affect historic or cultural resources? | | X | | | | |

| 13. SUMMARY EVALUATION OF SIGNIFICANCE<br>Will the proposed action, considered as a whole: | IMPACT Unknown | None | Minor | Potentially Significant | Can Impact Be Mitigated | Comment Index |
|---|---|---|---|---|---|---|
| a. Have impacts that are individually limited, but cumulatively considerable? (A project or program may result in impacts on two or more separate resources which create a significant effect when considered together or in total.) | | X | | | | |
| b. Involve potential risks or adverse effects which are uncertain but extremely hazardous if they were to occur? | | X | | | | |
| c. Potentially conflict with the substantive requirements of any local, state, or federal law, regulation, standard or formal plan? | | X | | | | |
| d. Establish a precedent or likelihood that future actions with significant environmental impacts will be proposed? | | X | | | | |
| e. Generate substantial debate or controversy about the nature of the impacts that would be created? | | X | | | | |
| f. Is the project expected to have organized opposition or generate substantial public controversy? (Also see 13e) | | X | | | | |
| g. List any federal or state permits required. | | X | | | | |

## PART III. EVALUATION OF ALTERNATIVES

One alternative was considered during the preparation of this EA.

1) No Action

The predicted consequences and results of the "No Action" alternative are:

- The extinction risk of WCT in the Elkhorn Mountains would not be reduced because two populations with high risks of extinction would not be "replicated" in new streams.
- The likelihood of losing unique WCT genetic characteristics would remain high with the high probability that the donor WCT populations will ultimately go extinct.
- About 5 miles of suitable fish habitat would remain fishless.
- No costs associated with introduction efforts.

## PART IV. ENVIRONMENTAL ASSESSMENT CONCLUSION SECTION

**1) Is an EIS required?**

No, the action is expected to have minimal or no impacts on the physical, biological and human environment, and is expected to be beneficial by helping achieve westslope cutthroat trout restoration goals in the Elkhorn Mountains.

**2) Person responsible for preparing this EA document:**

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**3) Duration of comment period, and public notification:**

Thirty days: April 20 through 5:00 pm, May 21, 2001. Comments may be sent to Lee Nelson, Montana Fish, Wildlife & Parks, 415 South Front Street, Townsend, MT 59644.

Public meetings regarding this project will be held on May 1, 2001, at the Jefferson County High School in Boulder (7:00 pm), and in Helena on May 2, 2001 (7:00 pm), at the National Forest Service Supervisors Office.

Legal notification of this Environmental Assessment was placed in the Boulder Monitor, Helena Independent Record, and Townsend Star.

## References

FWP. 1999a. Environmental Assessment Elkhorn Mountains Westslope Cutthroat Trout Restoration Program, Mountain Range Programmatic Assessment. Prepared by Ron Spoon and Jodie Canfield, Montana Fish, Wildlife and Parks, Region 3, Bozeman, Montana.

FWP. 1999b. Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout in Montana. Helena, Montana.

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# **APPENDIX A**: Biological and Physical Habitat Conditions of Donor and Receiving Streams

## Westslope cutthroat trout donor streams:

### Hall Creek

*Location*: T7N, R1W, tributary to Crow Creek (Figure 1)
*Proposed WCT transfer:* Hall Creek WCT eggs would be moved to Little Tizer Creek.
*WCT*:

*Distribution*: WCT occupy about 1 mile of stream above a road culvert that acts as a migratory barrier to nonnative trout. Upstream distribution is limited by diminishing stream size.

*Abundance*: Population abundances were estimated at 8 per 100 feet of stream in the lower half of the WCT reach, and 5 per 100 feet of stream in the upper half. Estimates were calculated with multiple-pass electrofishing in September 2000.

*Genetic status*: 100% pure, based on 50 fin clips collected in 1999 and 2000. Samples were analyzed at the Wild Trout and Salmon Genetics Laboratory, Missoula, in 2001.

*Health tests*: Thirty brook trout and 30 rainbow trout were collected as surrogates for WCT health tests in October 2000. Fish were collected below the WCT population in Hall Creek, and in Crow Creek immediately below the mouth of Hall Creek. Tests were negative except for bacterial kidney disease. Many fish were found infected with this bacterium, but the level of infection was low. Fish testing positive for bacterial kidney disease are common in wild trout populations in Montana.

*Comments*: Despite its small size (4 to 6 feet wide), Hall Creek maintains one of the higher density WCT populations in the Elkhorn Mountains. The WCT population does occupy a good quality habitat area, however, its limited distribution (1 mile) and small population size (about 300 to 400 fish) indicate it has a high risk of extinction.

### Prickly Pear Creek

*Location*: T7N, R3W, tributary to the Missouri River (Figure 1)
*Proposed WCT transfer:* Prickly Pear Creek WCT eggs would be moved to Eureka Creek, and eggs and live fish would be moved to upper Prickly Pear Creek.
*WCT*:

*Distribution*: WCT are the only occupants of a 1-mile stream section isolated from nonnative trout by a natural barrier. An additional natural barrier limits upstream distribution (see "Upper Prickly Pear Creek" description below).

*Abundance*: Population abundance estimates ranged from 2 to 7 per 100 feet of stream in three electrofishing estimates (multiple-pass depletion) conducted in September 2000.

*Genetic status*: 100% pure, based on 50 fin clips collected in 1999 and 2000.

*Health tests*: Sixty brook trout were collected as surrogates for WCT health tests. Fish were collected immediately below the natural fish barrier in October 2000. Like Hall

Creek, tests were negative except for fish testing positive for a low infection level of bacterial kidney disease.

*Comments*: Along with Hall and Dutchman creeks, Prickly Pear Creek maintains one of the strongest remaining populations in the Elkhorn Mountains. The population occupies a high quality habitat area that is currently protected from nonnative trout by a natural barrier. Upstream distribution could be expanded by about 0.7 miles with introductions above an additional natural barrier. Immediate threats to this population include its limited distribution and small population size (about 300 to 400 fish).

## Potential WCT receiving streams:

### Eureka Creek

*Location*: T7N, R1W, tributary to Crow Creek (Figure 1)
*Proposed WCT transfer:* Eureka Creek would receive WCT eggs from Prickly Pear Creek.
*Habitat*:

*Quantity and quality*: Eureka Creek and its tributaries (Longfellow, Teakettle, and Tin Cup) include about 2.2 miles of currently fishless habitat. A waterfall 1 mile above the stream mouth prevents upstream movement of all fish. At the lower end of fishless reach the stream is 8 – 10 feet wide and carries 3 – 5 cfs of water during the summer. The overall habitat quality is considered fair for resident trout: stream flow, water temperature, juvenile habitat, and substrate are good to high quality; while spawning gravel, deep pools, and large woody debris are sparse in some reaches.

*Invertebrate survey*: Dr. Dan Gustafson, Montana State University, collected aquatic invertebrate samples above and below the waterfall in November 1997. His samples indicated no threatened or endangered species, and species present were common in other streams with trout. See Appendix B (Table 1) for species collected, and also Comment 5c, page 10.

*Amphibian survey*: A 2000 foot section of the fishless reach was shocked in September 2000 to determine the presence of any rare larval amphibians (e.g., Pacific giant salamander and tailed frog). None were observed. Slow water areas preferred by amphibians (e.g., beaver ponds and old side channels) are rare or absent in the drainage. Also see Comment 5c, page 10.

*Comments*: Due to its large size and 2.2 miles of habitat, the Eureka Creek drainage is one of the best areas in the Elkhorn Mountain Range for WCT introductions into a currently fishless stream. While the lack of high quality pools may limit adult fish abundance in some reaches, the overall habitat quality indicates the drainage should support a sufficient WCT population for long-term persistence.

## Little Tizer Creek

*Location*: T7N, R2W, tributary to Crow Creek (Figure 1)
*Proposed WCT transfer:* Little Tizer Creek would receive WCT eggs from Hall Creek.
*Habitat*:

*Quantity and quality*: A barrier waterfall isolates about 1.9 miles of high quality habitat in Little Tizer Creek. The stream averages about 6 feet wide and maintains a flow of 4 cfs during the summer. The overall habitat quality is excellent with large pools, spawning gravel and woody debris very abundant. Low summer water temperatures may reduce the growth and survival of young-of-the-year trout.

*Invertebrate survey*: Dr. Dan Gustafson, Montana State University, collected aquatic invertebrate samples above and below the waterfall in September 2000. His samples indicated no threatened or endangered species, and species present were common in other streams with trout. See Appendix B (Table 2) for species collected, and also Comment 5c, page 10.

*Amphibian survey*: No rare larval amphibians were found in 1600 feet of electrofishing in the fishless reach (September 2000). Also see Comment 5c, page 10.

*Comments*: With a long fishless reach, stable barrier, and abundance of pools, Little Tizer Creek is considered a very good candidate for WCT introductions. The low water temperatures of this stream will limit some aquatic invertebrate production, and potentially, year to year recruitment of young fish. Due to these limitations, WCT density may be less than other comparatively sized streams; however, high quality over-wintering (deep pools) and spawning habitat should allow long-term population persistence.

## Upper Prickly Pear Creek

*Location*: T7N, R3W, tributary to the Missouri River (Figure 1)
*Proposed WCT transfer:* Upper Prickly Pear Creek would receive eggs and fish from lower Prickly Pear Creek.
*Habitat*:

*Quantity and quality*: A small waterfall prevents movement of WCT (only species immediately below waterfall) into about 1.4 stream miles in upper Prickly Pear Creek. Stream width in this reach averages 6 – 7 feet, and steam flow is about 4 cfs during summer. Good fish habitat (large stream with abundant pools) is found in the lower half of the fishless reach, however, fish numbers may be limited in the upper half by low water temperatures, barriers that may seasonally prevent fish movement, and high natural sediment loads that reduce pool quality and invertebrate densities.

*Invertebrate survey*: Collection and results similar to Little Tizer Creek. See Appendix B (Table 3) for species collected, and also Comment 5c, page 10.

*Amphibian survey*: No rare larval amphibians were found in 7500 feet of electrofishing in the fishless reach (September 2000). Also see comment 5c, page 10.

*Comments*: Because the distribution of WCT in Prickly Pear Creek is so limited (1 mile), any additional increase in range would be beneficial for this population. About 0.7 mile of the currently fishless reach is suitable habitat for WCT. While isolated WCT populations have persisted in stream sections this short for many years, it is difficult to predict the possibility for long-term persistence in upper Prickly Pear Creek. It is likely, however, that WCT introduction would establish a small population that would help preserve WCT in Prickly Pear Creek, and would benefit the overall Elkhorns Restoration Program by providing additional WCT resources available for introduction into other areas.

**APPENDIX B**: Lists of aquatic invertebrates collected by Dan Gustafson, Montana State University

Table 1: Eureka Creek
Table 2: Little Tizer Creek
Table 3: Prickly Pear Creek

Table 1. Aquatic invertebrates in Eureka Creek, (Montana, Broadwater county) below and above the historic fish barrier. The below and above samples were collected on 21 NOV 1997 by D.L. Gustafson with Chad BaconRind. The USFS sample was collected on 14 OCT 1997 by A. Harper and BaconRind from an area just upstream of the "above" sample. All identifications by D.L. Gustafson, except *Trichodrilus* sp. by Steve Fend, USGS.

| Taxa | below | above | USFS |
|---|---|---|---|
| **Order Ephemeroptera- mayflies** | | | |
| *Ameletus* sp. 1 | + | + | + |
| *Ameletus* sp. 2 | + | + | 0 |
| *Baetis tricaudatus* Dodds | + | + | 0 |
| *Caudatella hystrix* (Traver) | + | + | + |
| *Cinygmula* sp. | + | + | + |
| *Drunella doddsi* (Needham) | + | + | + |
| *Drunella spinifera* (Needham) | + | + | + |
| *Epeorus grandis* (McDunnough) | + | + | + |
| *Epeorus* sp. prob. *longimanus* (Eaton) | + | 0 | 0 |
| *Ephemerella infrequens* McDunnough | + | + | 0 |
| *Paraleptophlebia heteronea* (McDunnough) | + | + | + |
| *Rhithrogena robusta* Dodds | + | + | + |
| **Order Plecoptera- stoneflies** | | | |
| *Doroneuria theodora* (Needham & Claassen) | + | + | + |
| Family Capniidae | + | 0 | 0 |
| Family Chloroperlidae sp. 1 | + | + | + |
| Family Chloroperlidae sp. 2 | + | + | + |
| Family Chloroperlidae sp. 3 | + | + | 0 |
| Family Leuctridae | + | + | + |
| *Kogotus* sp. | + | + | 0 |
| *Megarcys* sp. prob. *watertoni* (Ricker) | + | + | + |
| *Prostoia besametsa* (Ricker) | + | 0 | 0 |
| *Visoka cataractae* (Neave) | + | + | + |
| *Zapada cinctipes* (Banks) | + | + | + |
| *Zapada columbiana* (Claassen) | + | + | + |
| *Zapada* sp. *oregonensis* group | 0 | + | + |
| **Order Trichoptera- caddisflies** | | | |
| *Anagapetus debilis* Ross | + | + | 0 |
| *Apatania* sp. | 0 | + | 0 |
| *Arctopsyche grandis* (Banks) | + | 0 | 0 |
| *Brachycentrus americanus* (Banks) | + | + | 0 |
| *Chyranda centralis* (Banks) | + | + | 0 |
| *Dicosmoecus atripes* (Hagen) | 0 | + | 0 |
| *Dolophilodes aequalis* (Banks) | 0 | + | + |
| *Ecclisiomyia conspersa* Banks | + | + | 0 |
| Family Limnephilidae Milne | + | 0 | + |
| *Glossosoma* sp. | + | 0 | 0 |
| *Lepidostoma cascadense* (Milne) | + | + | 0 |
| *Micrasema bactro* Ross | + | + | + |
| *Neothrema alicia* Dodds & Hisaw (cases only) | 0 | + | 0 |
| *Parapsyche elsis* Milne | + | + | + |
| *Rhyacophila hyalinata* Banks | + | 0 | 0 |
| *Rhyacophila narvae* Navas | + | + | + |
| *Rhyacophila* sp. *brunnea* group | + | + | + |
| *Rhyacophila vaccua* Milne | + | + | + |

Table 1. *Continued*

| Taxa | below | above | USFS |
|---|---|---|---|
| **Order Diptera- flies** | | | |
| Family Ceratopogonidae | + | + | 0 |
| Family Chironomidae many spp. | + | + | + |
| Family Pelecorhynchidae, *Glutops* sp. | + | + | 0 |
| Family Psychodidae, *Pericoma* sp. | + | + | 0 |
| Family Tipulidae 3+ spp. | + | + | + |
| **Order Coleoptera- beetles** | | | |
| *Amphizoa* sp. | + | 0 | 0 |
| *Heterlimnius corpulentus* (LeConte) | + | + | + |
| *Narpus concolor* (LeConte) | + | 0 | 0 |
| *Optioservus sp.* near *divergens* (LeConte) | 0 | + | 0 |
| *Oreodytes congruus* (LeConte) | + | 0 | 0 |
| **Phylum Annelida- segmented worms Class Oligochaeta** | | | |
| Family Enchytraeidae | + | 0 | 0 |
| Family Lumbricidae, earthworm, not *Eiseniella tetraedra* (Savigny) | 0 | + | 0 |
| Family Lumbriculidae, *Trichodrilus* sp. prob. new sp. | + | 0 | 0 |
| Family Tubificidae, *Rhyacodrilus* sp. | 0 | + | 0 |
| **Other taxa** | | | |
| Phylum Nematoda- nematodes or roundworms | + | + | 0 |
| Phylum Platyhelminthes- flatworms, *Polycelis* sp. | + | + | 0 |
| Subphylum Chelicerata- Order Acra- mites | + | + | 0 |
| Subphylum Crustacea- Order Podocopa- ostracods | + | + | 0 |

Table 2. Aquatic invertebrates at 3 sites near the head of Crow Creek, (Montana, Jefferson County). All sites are above fish barriers, but only Little Tizer Creek remains fishless. Collections and identifications by D.L. Gustafson.

| Taxa | Big Tizer | Lt. Tizer | Crow |
|---|---|---|---|
| **Order Ephemeroptera- mayflies** | | | |
| *Ameletus* sp. 1 | + | + | + |
| *Ameletus* sp. 2 | + | + | + |
| *Baetis bicaudatus* Dodds | + | 0 | + |
| *Baetis tricaudatus* Dodds | 0 | 0 | + |
| *Caudatella edmundsi* (Allen) | + | 0 | + |
| *Caudatella hystrix* (Traver) | + | + | + |
| *Cinygma integrum* Eaton | + | + | + |
| *Cinygmula* sp. 1 | + | + | + |
| *Cinygmula* sp. 2 | 0 | 0 | + |
| *Diphetor hageni* (Eaton) | + | + | + |
| *Drunella doddsi* (Needham) | + | 0 | + |
| *Drunella grandis* (Eaton) | 0 | 0 | + |
| *Drunella spinifera* (Needham) | + | + | + |
| *Epeorus grandis* (McDunnough) | + | 0 | + |
| *Ephemerella aurivillii* (Bengtsson) | + | 0 | + |
| *Ephemerella infrequens* McDunnough | + | 0 | + |
| *Paraleptophlebia heteronea* (McDunnough) | + | + | + |
| *Rhithrogena robusta* Dodds | + | + | + |
| **Order Plecoptera- stoneflies** | | | |
| Capniidae | + | + | + |
| Chloroperlinae sp. 1 | + | + | + |
| Chloroperlinae sp. 2 | + | + | + |
| Chloroperlinae sp. 3 | + | 0 | + |
| *Doddsia occidentalis* (Banks) | + | + | + |
| *Doroneuria theodora* (Needham & Claassen) | + | + | + |
| *Hesperoperla pacifica* (Banks) | + | 0 | + |
| *Isoperla sobria* (Hagen) | 0 | + | + |
| *Kathroperla perdita* Banks | 0 | 0 | + |
| *Kogotus* sp. | + | 0 | + |
| Leuctridae | + | + | + |
| *Megarcys* sp. prob. *watertoni* (Ricker) | + | 0 | + |
| *Skwala americana* (Klapalek) | + | 0 | + |
| *Visoka cataractae* (Neave) | + | + | + |
| *Yoraperla brevis* (Banks) | + | + | + |
| *Zapada cinctipes* (Banks) | + | 0 | + |
| *Zapada columbiana* (Claassen) | + | + | + |
| *Zapada* sp. *oregonensis* group | + | + | + |

Table 2. *Continued*

| Taxa | Big Tizer | Lt. Tizer | Crow |
|---|---|---|---|
| **Order Trichoptera- caddisflies** | | | |
| *Arctopsyche grandis* (Banks) | + | 0 | + |
| *Chyranda centralis* (Banks) | 0 | + | + |
| *Dolophilodes aequalis* (Banks) | + | + | + |
| *Ecclisiomyia conspersa* Banks | + | + | + |
| *Glossosoma* sp. | + | 0 | + |
| *Homophylax* sp. | 0 | + | 0 |
| *Lepidostoma cascadense* (Milne) | + | + | + |
| *Lepidostoma spicatum* Denning | 0 | + | 0 |
| *Micrasema bactro* Ross | + | + | + |
| *Parapsyche elsis* Milne | 0 | + | 0 |
| *Psychoglypha* sp. | 0 | + | 0 |
| *Rhyacophila angelita* Banks | + | 0 | + |
| *Rhyacophila hyalinata* Banks | + | + | + |
| *Rhyacophila narvae* Navas | + | + | + |
| *Rhyacophila* sp. *brunnea* group | + | + | + |
| *Rhyacophila vaccua* Milne | + | + | + |
| *Rhyacophila verrula* Milne | 0 | + | 0 |
| *Rhyacophila vofixa* Milne | 0 | + | 0 |
| **Order Diptera- flies** | | | |
| Family Ceratopogonidae | + | + | 0 |
| Family Chironomidae many spp. | + | + | + |
| Family Empididae | + | + | + |
| Family Pelecorhynchidae, *Glutops* sp. | 0 | + | 0 |
| Family Simulidae | + | + | 0 |
| Family Tipulidae sp. 1 | + | + | + |
| Family Tipulidae sp. 2 | + | + | 0 |
| Family Tipulidae sp. 3 | + | 0 | 0 |
| **Order Coleoptera- beetles** | | | |
| *Cleptelmis ornata* (Schaeffer) | + | 0 | + |
| *Heterlimnius corpulentus* (LeConte) | + | 0 | + |
| *Optioservus sp.* near *divergens* (LeConte) | + | 0 | 0 |
| **Phylum Annelida- segmented worms Class Oligochaeta** | | | |
| Results are pending slide processing. | | | |
| **Other taxa** | | | |
| Phylum Mollusca, Family Sphaeriidae- fingernail clams | + | + | 0 |
| Phylum Platyhelminthes- flatworms, *Polycelis* sp. | + | + | + |
| Subphylum Chelicerata- Order Acra- mites | + | + | + |
| Subphylum Crustacea- Order Podocopa- ostracods | + | + | + |

Table 3. Aquatic invertebrates in Prickly Pear Creek, (Montana, Broadwater County) below and above the historic fish barrier. Collection and identifications by D.L. Gustafson (Ecology Department, MSU-Bozeman).

| Taxa | below | above |
|---|---|---|
| **Order Ephemeroptera- mayflies** | | |
| *Ameletus* sp. 1 | + | + |
| *Ameletus* sp. 2 | + | + |
| *Ameletus* sp. 3 | + | + |
| *Baetis bicaudatus* Dodds | + | + |
| *Caudatella edmundsi* (Allen) | + | 0 |
| *Cinygma integrum* Eaton | + | + |
| *Cinygmula* sp. 1 | + | + |
| *Cinygmula* sp. 2 | + | + |
| *Diphetor hageni* (Eaton) | + | + |
| *Drunella spinifera* (Needham) | + | + |
| *Epeorus grandis* (McDunnough) | + | + |
| *Ephemerella infrequens* McDunnough | + | + |
| *Paraleptophlebia heteronea* (McDunnough) | + | + |
| *Rhithrogena robusta* Dodds | + | + |
| **Order Plecoptera- stoneflies** | | |
| Capniidae | + | 0 |
| Chloroperlinae sp. 1 | + | + |
| Chloroperlinae sp. 2 | + | + |
| Chloroperlinae sp. 3 | + | + |
| *Doroneuria theodora* (Needham & Claassen) | + | + |
| *Isoperla sobria* (Hagen) | + | + |
| *Kathroperla perdita* Banks | 0 | + |
| *Kogotus* sp. | + | + |
| Leuctridae | + | + |
| *Megarcys* sp. prob. *watertoni* (Ricker) | + | + |
| *Setvena bradleyi* (Smith) | 0 | + |
| *Visoka cataractae* (Neave) | + | + |
| *Yoraperla brevis* (Banks) | + | + |
| *Zapada columbiana* (Claassen) | + | + |
| *Zapada* sp. *oregonensis* group | + | + |
| **Order Trichoptera- caddisflies** | | |
| *Anagapetus debilis* Ross | + | 0 |
| *Chyranda centralis* (Banks) | + | + |
| *Cryptochia furcata* Denning | 0 | + |
| *Dolophilodes aequalis* (Banks) | + | 0 |
| *Homophylax* sp. | + | + |
| *Lepidostoma cascadense* (Milne) | + | + |
| *Micrasema bactro* Ross | + | + |
| *Neothrema alicia* Dodds & Hisaw | + | + |
| *Parapsyche elsis* Milne | + | + |
| *Psychoglypha* sp. | + | + |
| *Rhyacophila hyalinata* Banks | 0 | + |
| *Rhyacophila narvae* Navas | + | + |
| *Rhyacophila* sp. *brunnea* group | + | + |
| *Rhyacophila vaccua* Milne | + | + |
| *Rhyacophila verrula* Milne | + | + |
| *Rhyacophila vofixa* Milne | 0 | + |

Table 3. *Continued*

| Taxa | below | above |
|---|---|---|
| **Order Diptera- flies** | | |
| Family Chironomidae many spp. | + | + |
| Family Empididae | 0 | + |
| Family Pelecorhynchidae, *Glutops* sp. | + | + |
| Family Psychodidae, *Pericoma* sp. | + | + |
| Family Tipulidae sp. 1 | + | + |
| Family Tipulidae sp. 2 | + | + |
| **Order Coleoptera- beetles** | | |
| *Ametor scabrosus* (Horn) | 0 | + |
| *Amphizoa* sp. | 0 | + |
| *Heterlimnius corpulentus* (LeConte) | + | + |
| **Phylum Annelida- segmented worms Class Oligochaeta** | | |
| Results pending slide processing. | | |
| **Other taxa** | | |
| Phylum Platyhelminthes- flatworms, *Polycelis* sp. | + | + |
| Subphylum Chelicerata- Order Acra- mites | + | + |
| Subphylum Crustacea- Order Podocopa- ostracods | + | + |